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Signature

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant: Kenneth A. Krupa                      Examiner: Not yet Assigned  
Serial No.: 09/863,794                      Art Unit: Not yet Assigned  
Filed: May 23, 2000                      Attorney Docket No.: KRU-3.2.001/3430  
FOR: System and Method for Converting an XML Data Structure into a relational Database

Box Non-Fee Amendment  
Assistant Commissioner for Patents  
Washington, DC 20231

PRELIMINARY AMENDMENT

Dear Sir:

Please amend the application as follows:

IN THE SPECIFICATION:

Please delete the Brief Summary of the Invention and replace it with the following Brief

Summary of the Invention:

An aspect of the invention provides a method of forming a relational database from an Extensible Markup Language (XML) document. The XML document includes multiple nodes. The method includes assigning an identifier to every node of the XML document and assigning a respective sequence identifier to each node of the XML document. The respective sequence

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identifiers identify an order of the nodes in the XML document. The method also includes converting each node of the XML document into a respective row of the relational database.

Another aspect of the invention provides a method of forming a relational database from an Extensible Markup Language (XML) document. The method includes assigning an identifier to the XML document and creating a row of the relational database that includes the identifier, and content of one of the plurality of nodes that makes up the XML document.

Yet another aspect of the invention provides a relational database. The database includes a row containing content from a node of an Extensible Markup Language (XML) document. The row also includes an XML document identifier.

The invention will next be described in connection with certain illustrated embodiments and practices. However, it will be clear to those skilled in the art that various modifications, additions and subtractions can be made without departing from the spirit or scope of the claims.

#### IN THE CLAIMS:

Please cancel Claims 1-6 and please add the following new Claims 7-25:

7. (New) A method of forming a relational database from an Extensible Markup Language (XML) document formed of a plurality of nodes, the method comprising:  
assigning an identifier to every node of the XML document;  
assigning a respective sequence identifier to each node of the XML document; wherein said respective sequence identifiers identify an order of the nodes in the XML document; and,  
converting each node of the XML document into a respective row of the relational database.

8. (New) The method according to Claim 7 wherein said converting comprises:  
processing a prolog of the XML document if one is present;  
subsequent to processing the prolog, processing a body of the XML document; and,  
subsequent to processing the body, processing an epilog of the XML document if one is present.

9. (New) The method according to Claim 8 wherein:

processing the prolog includes:

retrieving a node from the prolog;

determining a type for the node;

subsequent to a determination that the node type is a processing instruction:

determining a target for the node;

determining an instruction for the node; and,

creating a row of the relational database that includes the identifier, the

sequence identifier for the node, an XML document name, the target, the node type, and the instruction; and,

subsequent to a determination that the node type is a comment:

determining the comment; and,

creating a row of the relational database that includes the identifier, the

sequence identifier for the node, an XML document name, the comment, and the node type.

10. (New) The method according to Claim 9 further including incrementing the sequence

identifier subsequent to creating the row of the relational database and repeating.

11. (New) The method according to Claim 8 wherein:

processing the epilog includes:

retrieving a node from the epilog;

determining a type for the node;

subsequent to a determination that the node type is a processing instruction:

determining a target for the node;

determining an instruction for the node; and,

creating a row of the relational database that includes the identifier, the

sequence identifier for the node, an XML document name, the target, the node type, and the instruction; and,

subsequent to a determination that the node type is a comment:

determining the comment; and,

creating a row of the relational database that includes the identifier, the

sequence identifier for the node, an XML document name, the comment, and the node type.

12. (New) The method according to Claim 11 further including incrementing the sequence identifier subsequent to creating the row of the relational database.

13. (New) The method according to Claim 8 wherein:

processing the body includes:

retrieving an XML element;

determining if the element is empty;

setting an empty element variable to a value based upon the determination; and,

creating a row of the relational database that includes the identifier, the sequence identifier for the node, and attributes of the element.

14. (New) The method according to Claim 13 wherein the attributes of the element include: an element name, an attribute type, and an attribute value.

15. (New) The method according to Claim 13 wherein the row further includes the value of the empty element variable, an ancestor and a parent.

16. (New) The method according to Claim 13 further comprising:

retrieving another element;

determining a type for the another element;

subsequent to a determination that the element type is a processing instruction:

determining a target for the element;

determining an instruction for the element; and,

creating a row of the relational database that includes the identifier, the

sequence identifier for the node, an element name, the target, the element type, and the

instruction;

subsequent to a determination that the element type is a comment:

determining text of the comment; and,

creating a row of the relational database that includes the identifier, the

sequence identifier for the node, an element name, the comment, and the element type; and,

subsequent to a determination that the element type is a pcd data text:

determining how many times this element type has been encountered;

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determining text of the pcd data text; and,

creating a row of the relational database that includes the identifier, the sequence identifier for the node, an element name, the element type, an indication of the number of times this element type has been encountered, and the text; and,

subsequent to a determination that the element type is a cdata text:

determining how many times this element type has been encountered;

determining text of the cdata text; and,

creating a row of the relational database that includes the identifier, the sequence identifier for the node, an element name, the element type, an indication of the number of times this element type has been encountered, and the text.

17. (New) A method of forming a relational database from an Extensible Markup Language (XML) document formed of a plurality of nodes, the method comprising:
- assigning an identifier to the XML document; and,
- creating a row of the relational database that includes the identifier, and a content of one of the plurality of nodes.

18. (New) A relational database comprising:
- a database that includes a row containing, content from a node of an Extensible Markup Language (XML) document;
- wherein the row includes an XML document identifier.

19. (New) The relational database according to Claim 18 wherein said content includes:
- a sequence identifier for the node, an XML document name, a processing instruction, a

target of the processing instruction, and a node type.

20. (New) The relational database according to Claim 18 wherein said content includes:  
a sequence identifier for the node, an XML document name, a comment, and a node type.
21. (New) The relational database according to Claim 18 wherein said content includes:  
a sequence identifier for the node, and XML element attributes.
22. (New) The relational database according to Claim 21 wherein said element attributes  
include:  
an element name, an attribute type, and an attribute value.
23. (New) The relational database according to Claim 18 wherein said content includes:  
a sequence identifier for the node, an element name, an element type, an indication of the  
number of times this element type has been encountered, and a text of the element.
24. (New) The relational database according to Claim 23 wherein said element type is  
pcdata.
25. (New) The relational database according to Claim 23 wherein said element type is cdata.

## REMARKS

This preliminary amendment is being presented prior to the issuance of a first office action. Claims 7-25 are now in this case. Claims 1-6 have been cancelled.

The Summary of the invention has been replaced by a new summary of the invention that supports new claims 7-25. Claims 7-25 are also supported by the Detailed Description of the Invention. No new matter has been added.

Dated: October 22, 2001

Respectfully Submitted,



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## Marked up Version of the Amended Brief Summary of the Invention

[An aspect of the invention provides a method of forming a relational database. The method includes mapping a corresponding unique key to each tree component of an Extensible Markup Language (XML) document. The mapping includes forming each of the corresponding unique keys as associated tree strings. Each of the associated tree strings includes in corresponding hierarchical order derived from the tree components a parent, a child, and a descriptor. The parent is an element, the child is an attribute, and the descriptor is text. The method further includes assigning a qualifier, as warranted, to the child that has a possibility of repeating with another child sharing the parent in common and assigning another qualifier, as warranted, to the descriptor that has a possibility of repeating with another descriptor sharing the child in common.

Another aspect of the invention provides a relational database structure. The relational database structure includes a database that contains corresponding unique keys mapped to tree components of an Extensible Markup Language (XML) document. Each of the corresponding unique keys is associated with tree strings and each of the associated tree strings includes in corresponding hierarchical order derived from the components a parent, a child, and a descriptor. The parent is an element, the child is an attribute, and the descriptor is text. The database also includes a qualifier assigned, as warranted, to the child that has a possibility of repeating with another child sharing the parent in common. The database also includes another qualifier assigned, as warranted, to the descriptor that has a possibility of repeating with another descriptor sharing the child in common.]

An aspect of the invention provides a method of forming a relational database from an Extensible Markup Language (XML) document. The XML document includes multiple nodes. The method includes assigning an identifier to every node of the XML document and assigning a

respective sequence identifier to each node of the XML document. The respective sequence identifiers identify an order of the nodes in the XML document. The method also includes converting each node of the XML document into a respective row of the relational database.

Another aspect of the invention provides a method of forming a relational database from an Extensible Markup Language (XML) document. The method includes assigning an identifier to the XML document and creating a row of the relational database that includes the identifier, and content of one of the plurality of nodes that makes up the XML document.

Yet another aspect of the invention provides a relational database. The database includes a row containing content from a node of an Extensible Markup Language (XML) document. The row also includes an XML document identifier.

The invention will next be described in connection with certain illustrated embodiments and practices. However, it will be clear to those skilled in the art that various modifications, additions and subtractions can be made without departing from the spirit or scope of the claims.